

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 8223 (1999): Dimensions and Output Series for Rotating Electrical Machines [ETD 15: Rotating Machinery]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



IS 8223 : 1999
IEC 72-2 (1990)

भारतीय मानक
धूर्णी इलेक्ट्रिकल मशीनों के लिए आयाम एवं निर्गत श्रेणीक्रम
(पहला पुनरीक्षण)

Indian Standard
DIMENSIONS AND OUTPUT SERIES FOR
ROTATING ELECTRICAL MACHINES
(*First Revision*)

ICS 29.160

© BIS 1999

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

April 1999

Price Group 6

NATIONAL FOREWORD

This Indian Standard which is identical with IEC 72-2 (1990) 'Dimensions and output series for rotating electrical machines — Part 2: Frame numbers 355 to 1 000 and flange numbers 1 180 to 2 360' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of Rotating Machinery Sectional Committee (ET 15), and approval of the Electrotechnical Division Council.

In the adopted standard certain terminology and conventions are not identical to those used in Indian Standards; attention is especially drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

Only the English language text in the International Standard has been retained while adopting it in this Indian Standard.

Indian Standard
**DIMENSIONS AND OUTPUT SERIES FOR
ROTATING ELECTRICAL MACHINES**
(First Revision)

1 Scope

This part of IEC 72 relates to all kinds of rotating electrical machines with a horizontal shaft, and with any one of three specific types of foot mounting — i.e. machines with feet down, machines with feet up, and machines for which the bed-plate is an integral part — and with mounting flange for which the shaft height in the feet down version is between 355 mm and 1 000 mm and pitch circle diameter of fixing holes between 1 180 and 2 360 mm.

2 Letter-symbols for dimensions

The symbols defined below are illustrated by the dimensional sketches in clause 7.

- A* — distance between centre-lines of fixing holes (end view).
- AA* — width of the end of the foot (end view).
- AB* — overall dimension across the feet (end view).
- AC* — diameter of the machine.
- AD* — distance from the centre-line of the machine to extreme outside of the terminal box or other most salient part mounted on the side of the machine.
- B* — distance between the centre-lines of the fixing holes (side view).
- BA* — length of the foot (side view).
- BB* — overall dimension across the feet (side view).
- C* — distance from the shoulder on the shaft at D-end to the centre-line of the mounting holes in the nearest feet.
- CA* — distance from the shoulder on the shaft at N-end to the centre-line of the mounting holes in the nearest feet.
- D* — diameter of the shaft extension at D-end.
- DA* — diameter of the shaft extension at N-end.
- E* — length of the shaft extension from the shoulder at D-end.
- EA* — length of the shaft extension from the shoulder at N-end.
- F* — width of the keyway of shaft extension at D-end.
- FA* — width of the keyway of the shaft extension at N-end.
- G* — distance from the bottom of the keyway to the opposite surface of the shaft extension at D-end.
- GA* — distance from the top of the key to the opposite surface of the shaft extension at D-end.
- GB* — distance from the bottom of the keyway to the opposite surface of the shaft extension at N-end.
- GC* — distance from the top of the key to the opposite surface of the shaft extension at N-end.
- GD* — thickness of the key of the shaft extension at D-end.
- GE* — depth of the keyway at the crown of the shaft extension at D-end.

- GF* — thickness of the key of the shaft extension at N-end.
GH — depth of the keyway at the crown of the shaft extension at N-end.
H — distance from the centre-line of the shaft to the bottom of the feet (basic dimension).
H' — distance from the centre-line of the shaft to the mounting surface — e.g. the bottom of the feet — in the feet-up version.
HA — thickness of the feet.
HC — distance from the top of the horizontal machine to the bottom of the feet.
HD — distance from the top of the lifting eye, the terminal box or other most salient part mounted on the top of the machine to the bottom of the feet.
HE — distance from the mounting surface to the lowest part of the machine in the feet-up version.
K — diameter of the holes or width of the slots in the feet of the machine.
L — overall length of the machine with a single shaft extension.
LA — thickness of the flange.
LB — distance from the mounting surface of the flange to the end of the machine.
LC — overall length of the machine when there is a shaft extension at N-end.
M — pitch circle diameter of the fixing holes.
N — diameter of the spigot.
P — outside diameter of the flange, or in the case of a non-circular outline twice the maximum radial dimension.
R — distance from the mounting surface of the flange to the shoulder on the shaft.
S — diameter of the fixing holes in the mounting flange or nominal diameter of the thread.
I — depth of the spigot.

NOTE — The designation of D and N-end of a machine is given in IEC 34-8.

3 Designation of machines

3.1 Foot-mounted machines

Frame sizes and shaft extensions shall be designated in the following way, by using the dimensions *H*, *H'*, *A*, *B*, *C*, *D* and *E* in millimeters.

$H(A/B/C)D/E$ or $H/H' (A/B/C)D/E$

Example: 710 (1180/1800/280) 130/200

3.2 Flange-mounted machines

Flange and shaft extensions shall be designated in the following way, by using the dimensions *M*, *S*, *D* and *E* in millimeters, the number of holes and the prefix FF if the flange has a spigot or FD if it has no spigot, under following form:

FF *M* (number of holes/*S*) *D/E* for flange with spigot

FD *M* (number of holes/*S*) *D/E* for flange without spigot.

Example: FF 1500 (12/28) 130/200

3.3 Foot- and flange-mounted machines

Combine 3.1 and 3.2 as follows:

$H(A/B/C) FF M$ (number of holes/*S*) *D/E*.

4 Fixing dimensions

Recommended values for dimensions H , A , B and C are given in 4.1 to 4.4. In the tables, the values given in IEC 72-1 are printed in italics. Dimensions for mounting flanges are given in 4.5.

4.1 Shaft heights

The shaft-heights are taken from ISO 496.

4.1.1 Machines with the mounting surface of the feet below the lowest point of the frame (feet down):

355 400 450 500 560 630 710 800 900 1000

4.1.2 Machines with the mounting surface of the feet above the lowest point of the frame (feet up):

0 160 250 315 400 500 630 800

4.2 A dimensions

Values for A dimensions are given in table 1. They are taken from the R 40 series with the exception of the values 610 mm and 686 mm.

Table 1 — A dimensions

Dimensions in millimetres

| H | Values for A | | | | | | | | | | | | |
|------|----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| 355 | 450 | 475 | 500 | 530 | 560 | 610 | 630 | 670 | 710 | 750 | 800 | 850 | 900 |
| 400 | 500 | 530 | 560 | 600 | 630 | 686 | 710 | 750 | 800 | 850 | 900 | 950 | 1000 |
| 450 | 560 | 600 | 630 | 670 | 710 | 750 | 800 | 850 | 900 | 950 | 1000 | 1060 | 1120 |
| 500 | 630 | 670 | 710 | 750 | 800 | 850 | 900 | 950 | 1000 | 1060 | 1120 | 1180 | 1250 |
| 560 | 710 | 750 | 800 | 850 | 900 | 950 | 1000 | 1060 | 1120 | 1180 | 1250 | 1320 | 1400 |
| 630 | 800 | 850 | 900 | 950 | 1000 | 1060 | 1120 | 1180 | 1250 | 1320 | 1400 | 1500 | 1600 |
| 710 | 900 | 950 | 1000 | 1060 | 1120 | 1180 | 1250 | 1320 | 1400 | 1500 | 1600 | 1700 | 1800 |
| 800 | 1000 | 1060 | 1120 | 1180 | 1250 | 1320 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 |
| 900 | 1120 | 1180 | 1250 | 1320 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2120 | 2240 |
| 1000 | 1250 | 1320 | 1400 | 1500 | 1600 | 1700 | 1800 | 1900 | 2000 | 2120 | 2240 | 2360 | 2500 |

NOTE — For machines with feet up, A dimensions should be chosen from the lines corresponding to the shaft height H that the machine would have had with feet down.

This normally corresponds to the Renard number equal or nearest higher to the distance from the shaft axis to the lowest point of the machine.

4.3 B dimensions

Values for *B* dimensions are given in table 2 and are taken from the Renard series R 20.
Other values of *B* than those given in table 2 may be used, provided they are taken from the R 20 series.

Table 2 — *B* dimensions

Dimensions in millimetres

| <i>H</i> | Values for <i>B</i> | | | | | | | | | | | | | | |
|----------|---------------------|-----|-----|-----|-----|-----|------|------|------|------|------|------|------|------|------|
| 355 | | | | 280 | 315 | 355 | 400 | 450 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 |
| 400 | | | | 315 | 355 | 400 | 450 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 |
| 450 | | | | 355 | 400 | 450 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 |
| 500 | | | | 400 | 450 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 |
| 560 | | | | 450 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 |
| 630 | | | | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 | 1800 |
| 710 | | | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 | 1800 | 2000 |
| 800 | | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 | 1800 | 2000 | 2240 |
| 900 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 | 1800 | 2000 | 2240 | 2500 |
| 1000 | 500 | 560 | 630 | 710 | 800 | 900 | 1000 | 1120 | 1250 | 1400 | 1600 | 1800 | 2000 | 2240 | 2800 |

NOTE — For machines with feet up, *B* dimensions should be chosen from the lines corresponding to the shaft height *H* that the machine would have had with feet down.
This normally corresponds to the Renard number equal or nearest higher to the distance from the shaft axis to the lowest point of the machine.

4.4 C dimensions

The values for *C* dimensions are the following (independent of shaft-height):

0 100 200 224 250* 280 315 335 355 375 400 425 450 475 500 530 560 600
630 670 710 750 800 900 1000

* NOTE — To comply with IEC 72-1 for *H* = 355, the value 254 for *C* should be used instead of 250.

The values 200–315 and 800–1000 are taken from the R 20 series, and the values 315–800 from the R 40 series.

4.5 Mounting flange dimensions

Table 3

| Flange number | | <i>M</i> | <i>N</i> | <i>P</i> | <i>R</i> | <i>S</i> | <i>T</i> | Maximum fillet radius of spigot mm | Number of holes | Mounting screw size |
|----------------------|----------------------|----------|----------|----------|----------|----------|--|------------------------------------|-----------------|---------------------|
| with spigot | without spigot | mm 1) | mm 2) | mm 3) | mm 4) | mm 5) | mm 6) | | | |
| FF1180 (8 or 16/28) | FD1180 (8 or 16/28) | 1 180 | 1 120 | 1 250 | 0 | 28 | $7 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 0,5 | 8 or 16 | <i>M</i> 24 |
| FF1320 (8 or 16/28) | FD1320 (8 or 16/28) | 1 320 | 1 250 | 1 400 | 0 | 28 | $8 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 0,5 | 8 or 16 | <i>M</i> 24 |
| FF1500 (12 or 24/28) | FD1500 (12 or 24/28) | 1 500 | 1 400 | 1 600 | 0 | 28 | $8 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 0,5 | 12 or 24 | <i>M</i> 24 |
| FF1700 (12 or 24/28) | FD1700 (12 or 24/28) | 1 700 | 1 600 | 1 800 | 0 | 28 | $9 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 1 | 12 or 24 | <i>M</i> 24 |
| FF1900 (12 or 24/35) | FD1900 (12 or 24/35) | 1 900 | 1 800 | 2 000 | 0 | 35 | $9 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 1 | 12 or 24 | <i>M</i> 30 |
| FF2120 (12 or 24/35) | FD2120 (12 or 24/35) | 2 120 | 2 000 | 2 240 | 0 | 35 | $10 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 1 | 12 or 24 | <i>M</i> 30 |
| FF2360 (16 or 32/35) | FD2360 (16 or 32/35) | 2 360 | 2 240 | 2 500 | 0 | 35 | $10 \begin{smallmatrix} 0 \\ -2 \end{smallmatrix}$ | 1 | 16 or 32 | <i>M</i> 30 |

- 1) Holes *S* are in the true position in reference to nominal *M* dimension (true concentric with datum circle *N*), with tolerance $\varnothing t = 2$ mm for *S* = 28 mm and $\varnothing t = 2,5$ mm for *S* = 35 mm (see ISO 1101 for $\varnothing t$).
- 2) Tolerance: h8. By agreement a reduced tolerance, h6, may be applied.
The spigot bore tolerance will be H9 with h8 and H7 with h6.
- 3) Maximum value (without a positive allowance): lower values and flats and cut-outs are permitted.
- 4) *R* = 0, unless otherwise agreed between the manufacturer and the purchaser.
- 5) Tolerance: H17. Closed or open slots are allowed. By agreement a reduced tolerance zone H14 may be applied.
- 6) The spigot should be rounded towards the flange face and chamfered towards the spigot face. An adequate length of the cylindrical spigot section should be provided.

5 Shaft extension dimensions, keys and keyways. Greatest permissible torques on continuous duty for a.c. motors

Table 4

| Diameter <i>D</i> (DA) | | | <i>E</i> ¹⁾ (EA) | | Key | | | | | | Keyway | | | | | | | | <i>GA</i> (GC) | Greatest torque on continuous duty for a.c. motors ³⁾ |
|----------------------------------|-----------------|-----|------------------------------------|-----------------|------------------|-----------------|-----|-------------------|------------------|------|------------------|-------------------------------|-----|-------------------------------|-------------------|------------------|-----------|----|-------------------|--|
| | | | | | <i>F</i> (FA) | | | <i>GD</i> (GF) | | | <i>F</i> (FA) | | | | <i>GE</i> (GH) | | | | | |
| Nominal value | Tolerance m6 | | Long series | Short series | Nominal value | Tolerance h9 | | Nominal value | Tolerance h11 | | Nominal value | Tolerance N9 ²⁾ | | Tolerance P9 ²⁾ | | Nominal value | Tolerance | | | |
| mm | µm | µm | | | | mm | mm | | mm | µm | | µm | mm | µm | µm | | mm | µm | µm | µm |
| 90 | +35 | +13 | 170 | 130 | 25 | 0 | -52 | 14 | 0 | -110 | 25 | 0 | -52 | -22 | -74 | 9 | +200 | 0 | 95 | 1900 |
| 95 | +35 | +13 | 170 | 130 | 25 | 0 | -52 | 14 | 0 | -110 | 25 | 0 | -52 | -22 | -74 | 9 | +200 | 0 | 100 | 2360 |
| 100 | +35 | +13 | 210 | 165 | 28 | 0 | -52 | 16 | 0 | -110 | 28 | 0 | -52 | -22 | -74 | 10 | +200 | 0 | 106 | 2800 |
| 110 | +35 | +13 | 210 | 165 | 28 | 0 | -52 | 16 | 0 | -110 | 28 | 0 | -52 | -22 | -74 | 10 | +200 | 0 | 116 | 4000 |
| 120 | +35 | +13 | 210 | 165 | 32 | 0 | -62 | 18 | 0 | -110 | 32 | 0 | -62 | -26 | -88 | 11 | +200 | 0 | 127 | 5300 |
| 125 | +40 | +15 | 210 | 165 | 32 | 0 | -62 | 18 | 0 | -110 | 32 | 0 | -62 | -26 | -88 | 11 | +200 | 0 | 132 | 6000 |
| 130 | +40 | +15 | 250 | 200 | 32 | 0 | -62 | 18 | 0 | -110 | 32 | 0 | -62 | -26 | -88 | 11 | +200 | 0 | 137 | |
| 140 | +40 | +15 | 250 | 200 | 36 | 0 | -62 | 20 | 0 | -130 | 36 | 0 | -62 | -26 | -88 | 12 | +300 | 0 | 148 | |
| 150 | +40 | +15 | 250 | 200 | 36 | 0 | -62 | 20 | 0 | -130 | 36 | 0 | -62 | -26 | -88 | 12 | +300 | 0 | 158 | |
| 160 | +40 | +15 | 300 | 240 | 40 | 0 | -62 | 22 | 0 | -130 | 40 | 0 | -62 | -26 | -88 | 13 | +300 | 0 | 169 | |
| 170 | +40 | +15 | 300 | 240 | 40 | 0 | -62 | 22 | 0 | -130 | 40 | 0 | -62 | -26 | -88 | 13 | +300 | 0 | 179 | |
| 180 | +40 | +15 | 300 | 240 | 45 | 0 | -62 | 25 | 0 | -130 | 45 | 0 | -62 | -26 | -88 | 15 | +300 | 0 | 190 | |
| 190 | +46 | +17 | 350 | 280 | 45 | 0 | -62 | 25 | 0 | -130 | 45 | 0 | -62 | -26 | -88 | 15 | +300 | 0 | 200 | |
| 200 | +46 | +17 | 350 | 280 | 45 | 0 | -62 | 25 | 0 | -130 | 45 | 0 | -62 | -26 | -88 | 15 | +300 | 0 | 210 | |
| 220 | +46 | +17 | 350 | 280 | 50 | 0 | -62 | 28 | 0 | -130 | 50 | 0 | -62 | -26 | -88 | 17 | +300 | 0 | 231 | |

¹⁾ In cases where the operating conditions are well defined, shaft extension dimensions may also be selected in accordance with existing ISO standards.

²⁾ The keyway tolerance N9 applies for normal keys, and P9 for fitted keys.

³⁾ The torque values are chosen from the R 40 series. In cases where the operating conditions are well defined, torque values might also be selected in accordance with existing ISO standards.

6 Preferred rated output values

Values are taken from the R 40 series.

kW

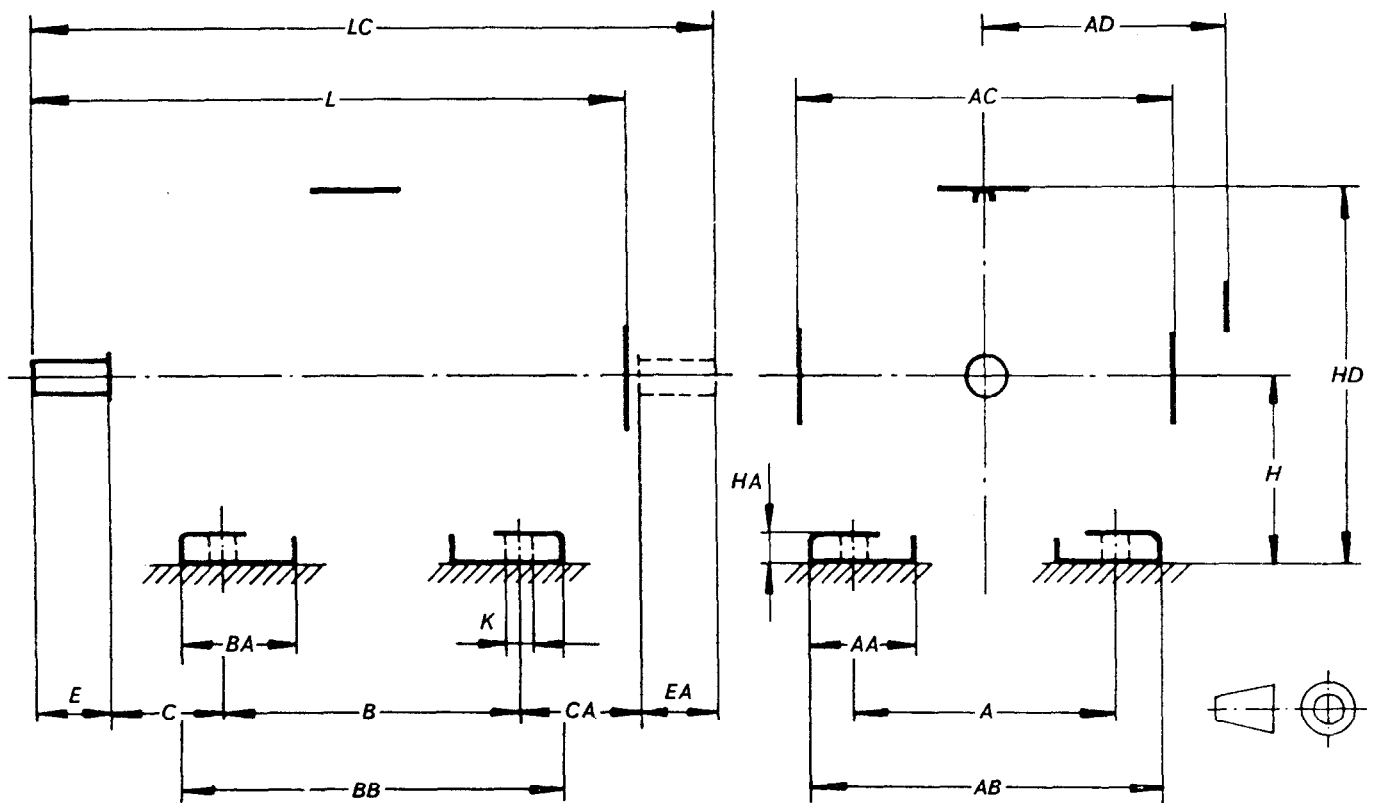
280, 300, 315, 335, 355, 375, 400, 425, 450, 475, 500, 530, 560, 600, 630, 670, 710, 750, 800, 850, 900, 950, 1000

For equivalent horsepower (HP) values, see annex D of IEC 72-1.

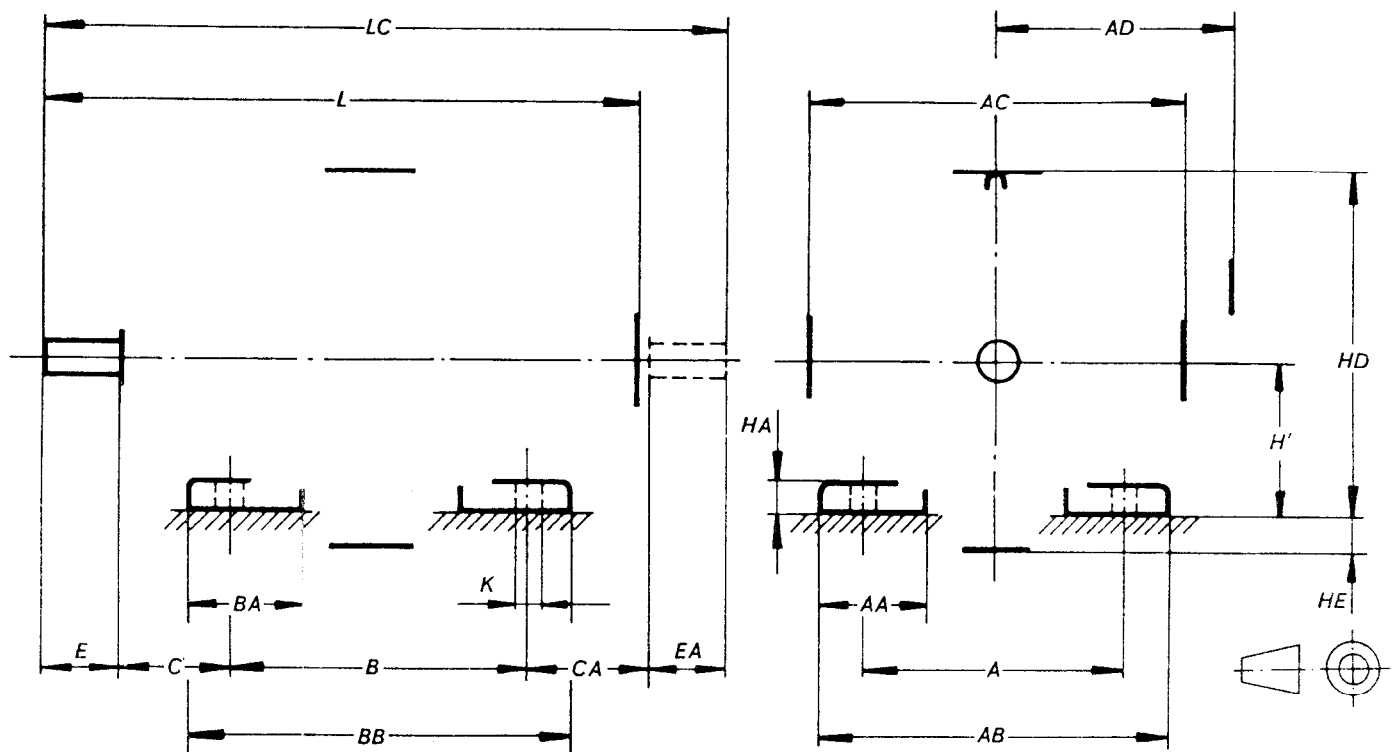
For generators the output shall be expressed in kilowatts (kW) or in kilovoltamperes (kVA), using the above values.

7 Dimensional sketches

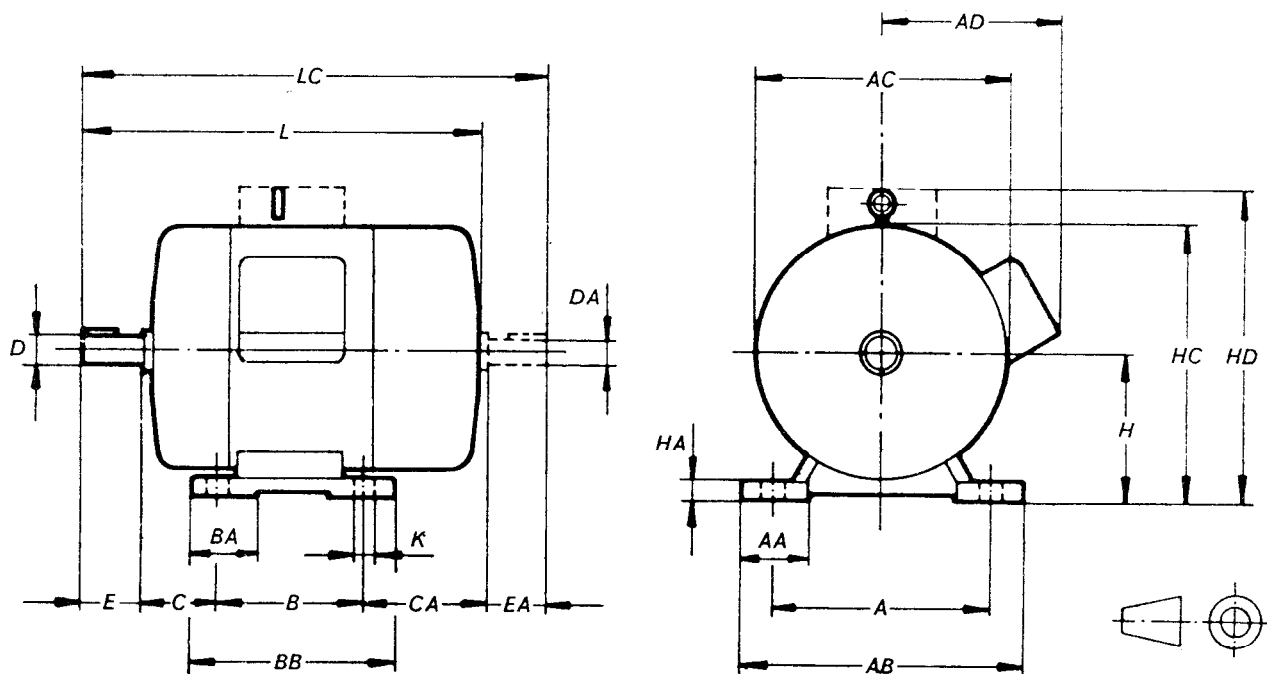
7.1 Principal dimensions, machines with undefined shape, and with feet down



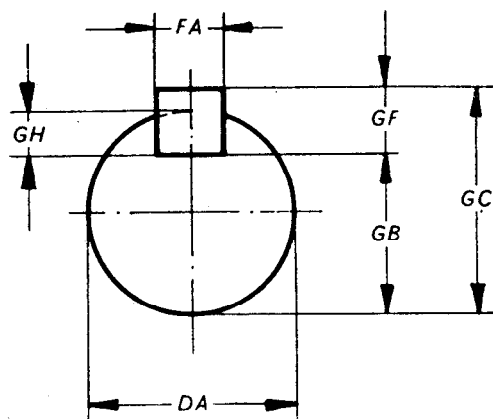
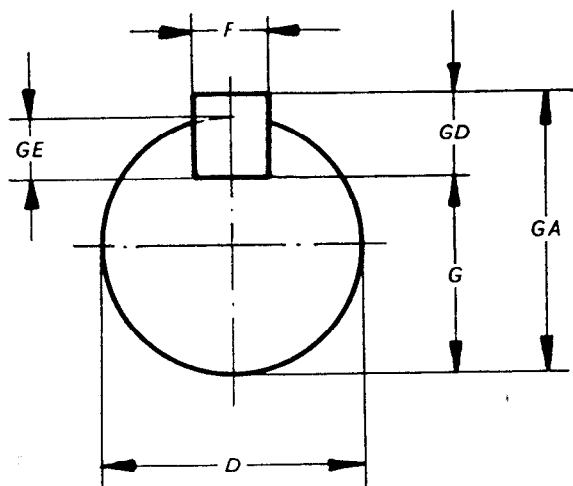
7.2 Principal dimensions, machines with undefined shape, and with feet up



7.3 Principal dimensions, machines with defined shape, and with feet down

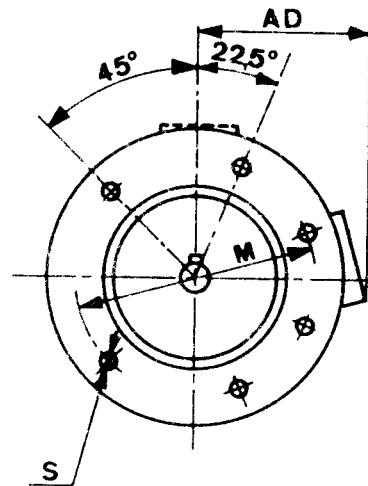
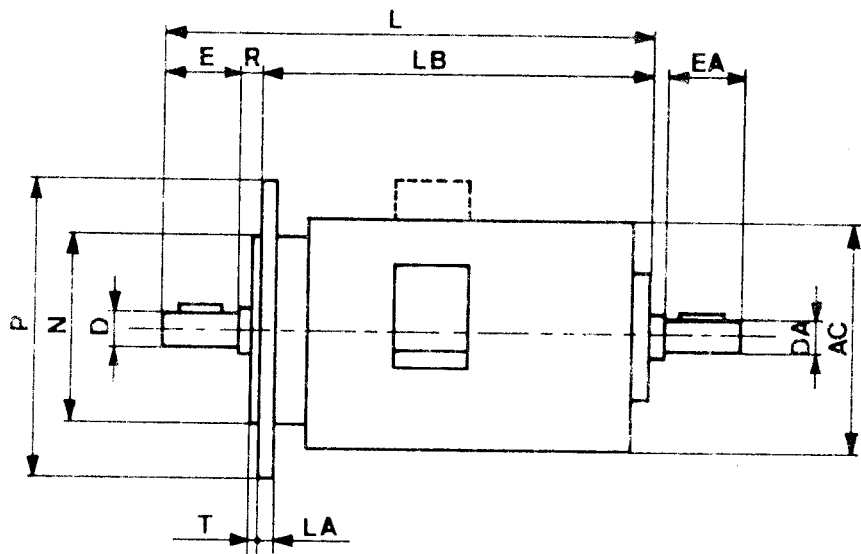


7.4 *Shaft extension dimensions*

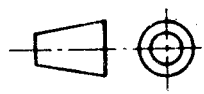
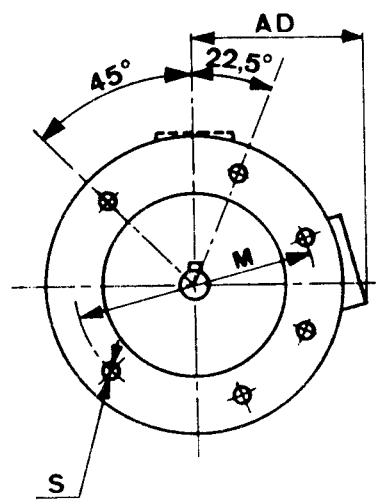
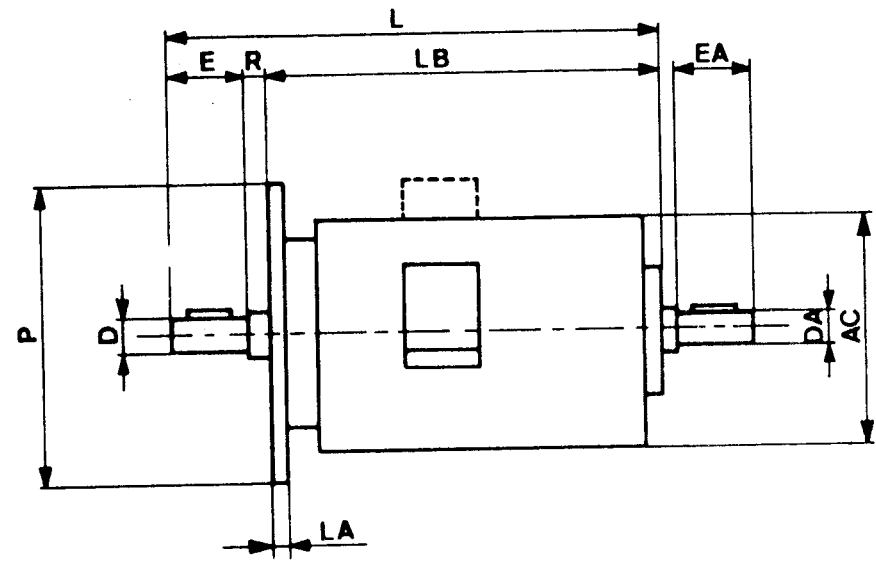


7.5 Principal dimensions, machines with defined shape and with mounting flange, with spigot

10



11



Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publication), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards Monthly Additions'.

This Indian Standard has been developed from Doc: No. ET 15 (4023).

Amendments Issued Since Publication

| Amend No. | Date of Issue | Text Affected |
|-----------|---------------|---------------|
| | | |
| | | |
| | | |

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 323 01 31, 323 33 75, 323 94 02

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices:

Telephone

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

323 76 17, 323 38 41

Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola
CALCUTTA 700054

{ 337 84 99, 337 85 61
337 86 26, 337 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 150022

{ 60 38 43
60 20 25

Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600113

{ 235 02 16, 235 04 42
235 15 19, 235 23 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400093

{ 832 92 95, 832 78 58
832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE. BHOPAL. BHUBANESHWAR.
COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI.
HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR.
PATNA. PUNE. THIRUVANANTHAPURAM.